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Attractor cosmology from nonminimally coupled gravity

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2018 American Physical Society. By using a bottom-up reconstruction technique for nonminimally coupled scalar-tensor theories, we realize the Einstein frame attractor cosmologies in the Ω(φ)-Jordan frame. For our approach, what is needed for the reconstruction method to work is the functional form of the nonminimal coupling Ω(φ) and of the scalar-t--tensor ratio, and also the assumption of the slow-roll inflation in the Ω(φ)-Jordan frame. By appropriately choosing the scalar-to-tensor ratio, we demonstrate that the observational indices of the attractor cosmologies can be realized directly in the Ω(φ)-Jordan frame. We investigate the special conditions that are required to hold true in for this realization to occur, and we provide the analytic form of the potential in the Ω(φ)-Jordan frame. Also, by performing a conformal transformation, we find the corresponding Einstein frame canonical scalar-tensor theory, and we calculate in detail the corresponding observational indices. The result indicates that although the spectral index of the primordial curvature perturbations is the same in the Jordan and Einstein frames, at leading order in the e-foldings number, the scalar-to-tensor ratio differs. We discuss the possible reasons behind this discrepancy, and we argue that the difference is due to some approximation we performed to the functional form of the potential in the Einstein frame, in order to obtain analytical results, and also due to the difference in the definition of the e-foldings number in the two frames, which is also pointed out in the related literature. Finally, we find the F(R) gravity corresponding to the Einstein frame canonical scalar-tensor theory.

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